A COMPARISON BETWEEN CASSAVA PROCESSING AT SMALL-SCALE IN VIETNAM AND IN COLOMBIA

Guillaume DA[1,2,4], Dominique DUFOUR[1,3], Andres GIRALDO[3], Martin MORENO[5], Tereza SANCHEZ[3], Claude MAROUZE[1]

[1] Centre de Coopération International en Recherche Agronomique pour le Développement (CIRAD), Montpellier, France
[2] École Nationale Supérieure de Biologie Appliquée à la Nutrition et à l'Alimentation (ENSBANA), Université de Bourgogne, Dijon, France
[3] Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia
[4] Hanoi University of Technology (HUT), Hanoi, Vietnam
[5] University of Univalle, Cali, Colombia

Introduction

Examining processes indicates that there is diversity in cassava starch manufacturing. Despite some figures revealing potential differences between processes at a small-scale, they remain difficult to compare because of the use of different methodologies to estimate their components. This study uses a similar methodology of diagnosis as a comparison tool in evaluating two types of manufacturing processes at small-scale, where contrasted extraction technologies are used. A range of selective measurements are applied to cassava wet starch processing units in craft villages of Northern Vietnam and in the Cauca Valley of South-western Colombia.

Materials and methods

Cassava roots were obtained from 2 varieties (*mper 183* and *algodona)* and were processed into wet starch in an agro-industry from Cauca Valley in Colombia in June 2007 [1].

Diagnosis methodology was used to evaluate the efficiency of the manufacturing process. The results were compared to the manufacturing process conducted at similar scale in Northern Vietnam [2].

The particle size of fibres produced from different types of raspers were measured by wet sieving methods, in order to compare the processing efficiency [3].

Results and discussion

The cassava varieties *mper 183* and *algodona* didn't show significant difference in the composition of the products collected from particular stages of the manufacturing process (**Tab.1**)

Tab.1. Composition of the products (% dry matter) collected from particular stages of the cassava wet starch manufacturing process in Colombia (2007)

Product	Starch	Crude fibers	Ash
variety			
Washed roots			
mper 183	86.0 ± 5.6	5.5 ± 0.2	3.1
algodona	87.5 ± 1.6	3.7 ± 0.4	nd
Bagasse			
mper 183	62.1 ± 6.3	19.7 ± 1.7	nd
algodona	70.2 ± 6.0	13.6 ± 1.0	nd
« Mancha »			
mper 183	82.3 ± 1.9	0.3 ± 0.0	1.1 ± 0.0
algodona	62.6 ± 1.4	1.4 nd	3.7 ± 1.1
Wet starch			
mper 183	nd	0.3 ± 0.1	0.2 ± 0.1
algodona	nd	0.2 ± 0.1	0.2 ± 0.0

The manufacturing process from Colombia enabled 65% recovery of the starch present in fresh roots from both cultivars. Despite the use of two "coladoras" in parallel, the manufacturing process in Cauca was limited by the extraction stage, in which 3-fold lower capacities than in Vietnam were observed. Water consumption was 3.5-fold higher than at similar scale in Vietnam in 2006 (**Tab.2**).

Tab. 2. A comparison between the efficiencies of the processes for manufacturing cassava wet starch at small-scale in Colombia and in Vietnam in 2007.

Processing characteristics	Type of technology		
	1 cylindrical rasper + 2 coladora extractors (Colombia)		1 rasping-extractor (Vietnam)
	mper 183 (trial 1)	*algodona* (trial 2)	high yield variety
Mass balance (*)			
Washed roots	100.0 ± 0.0	100.0 ± 0.0	100.0 nd
Bagasse	**20.7** ± 1.5	**22.1** ± 0.7	**14.1** ± 1.0
Mancha	10.0 ± 0.3	3.6 ± 0.4	3.3 ± 3.4
Sedimented starch	54.6 ± 1.5	54.5 ± 3.1	66.3 ± 0.8
Sun-dried starch	52.3 ± 1.5	nd	nd
Estimation of loss *in % fresh matter*			
Washing-Peeling	6.6 ± 0.9	7.9 ± 1.1	3.0 ± 1.0
in kg of dry matter			
(1) : Rasping-Extraction-Settling	15.6 ± 1.4	19.8 ± 3.3	17.0 ± 2.0
(2) : Sun-drying	2.8 ± 0.2	nd	0
(1) + (2)	18.4 ± 1.2	nd	17.0 ± 2.0
Yield components (%)			
Processing yield	**17.1** ± 0.7	**16.3** ± 0.9	**27.0** ± 1.7
Overall starch recovery	**58.8** ± 3.5	**65.8** ± 3.3	**76.1** ± 1.9
Rasping effect	**79.5** ± 4.0	**78.1** ± 3.1	**93.1** ± 0.9
Processing capacities (**)			
Washing	1.98 ± 0.20	1.68 ± 0.16	1.10 ± 0.10
Rasping	1.37 ± 0.05	2.42 ± 0.23	
Extraction	**0.28** ± 0.00	**0.31** ± 0.06	**0.86** ± 0.10
Water consumption (***)			
Washing	9.1 ± 2.0	9.3 ± 0.5	2.0 ± 0.9
Rasping	2.8 nd	3.0 ± 0.7	
Extraction	nd	29.8 ± 6.0	18.8 (****) ± 0.4
Second Sieving	nd	12.2 ± 6.0	0
Cleaning equipment	nd	12.5 ± 1.3	nd
Volume of starch milk in settling tank	61.1 ± 14.2	49.0 ± 8.9	nd

The processing equipments used in this comparative study in Vietnam and in Colombia were respectively [1 cylindrical rasper with 2 coladora-extractors] and [1 rasper-extractor]. The standard deviations are indicated with a "±" sign.
(*) based on 100 kg of dry washed roots
(**) based on tonne of entering material per hour
(***) based on cubic meter of water consumed per tonne of starch at 12% moisture (wet basis).
(****)The data reported for type C during the extraction stage includes the volume of water used for both rasping and extraction stages which worked simultaneously

In Cauca, the capacity of a single engine of 8 KW was efficient to run the factory. Electrical power consumed per tone of starch was 59 kWh, in which, washing, rasping, and extraction stages accounted for 8, 14 and 38 kWh.

The particle size of fibers obtained with the cylindrical rasper from Cauca was significantly larger than the particle size of fibers obtained with the rasping disc utilized at small scale in Vietnam (**Fig.1-2-3**).

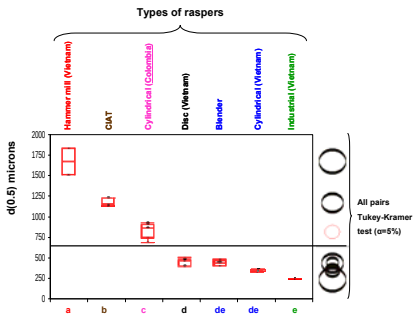

Fig.1 Particle size measurement of fibres from different raspers
Levels not connected by same letter are significantly different

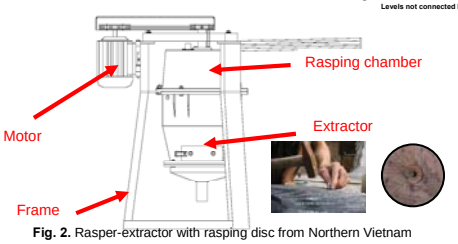

Fig. 2. Rasper-extractor with rasping disc from Northern Vietnam

Fig. 3. Cylindrical rasper from Cauca

Conclusion-perspectives

The comparison proposed in this study revealed the main differences between cassava wet starch manufacturing at small-scale in Vietnam and in Colombia. However, the methodology can be used elsewhere to supplement information for research and development issues on agro-industries.

References

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